

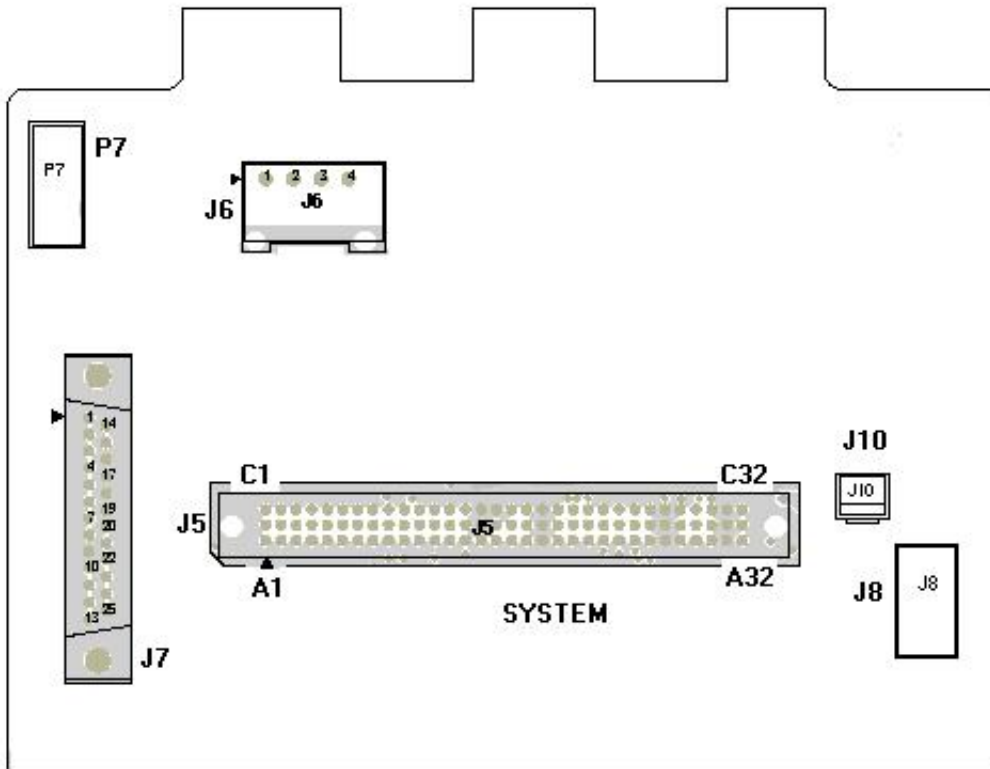
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MTR2000 Rear-of-station (backplane) Connectors

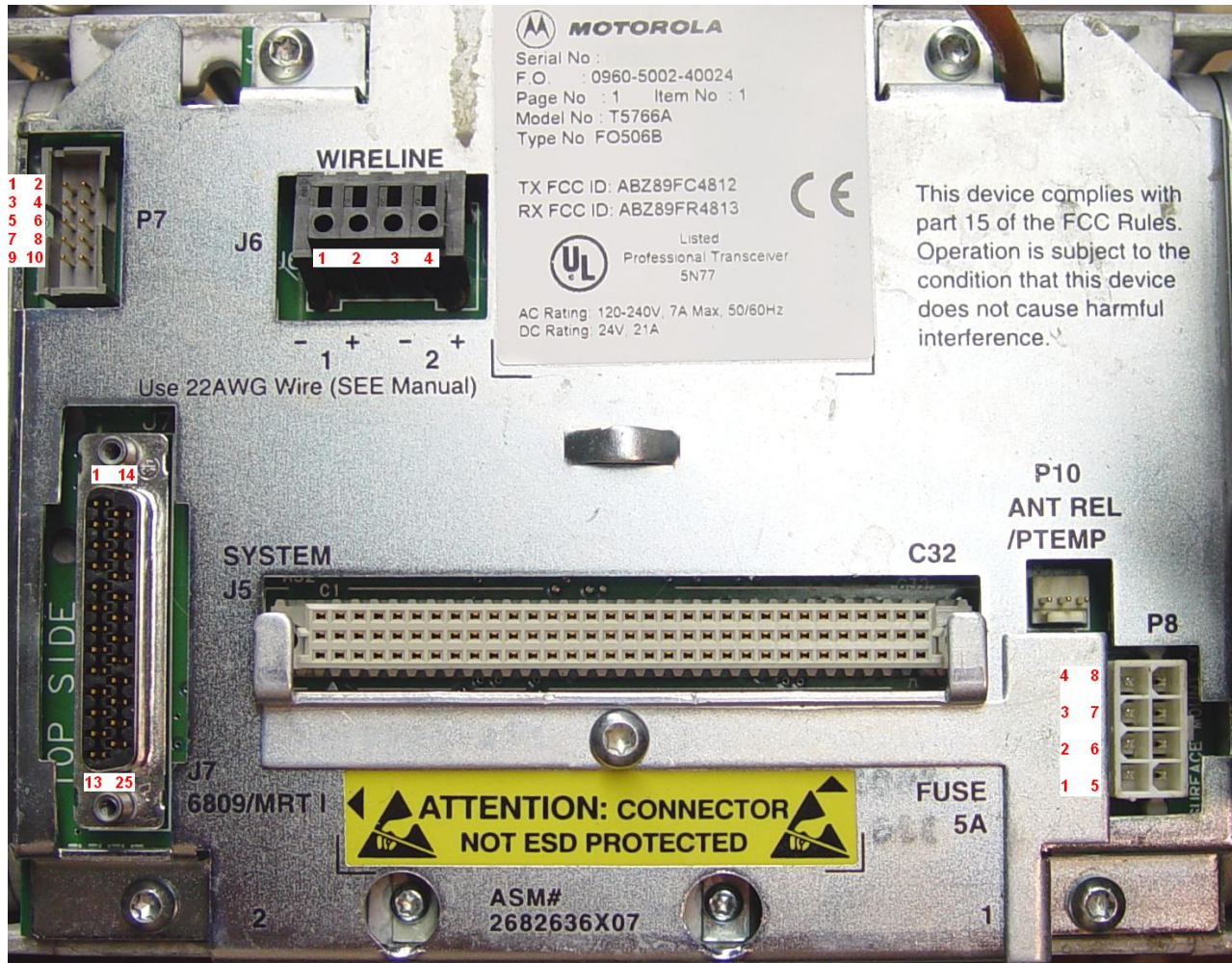
Compiled by Robert W. Meister WA1MIK



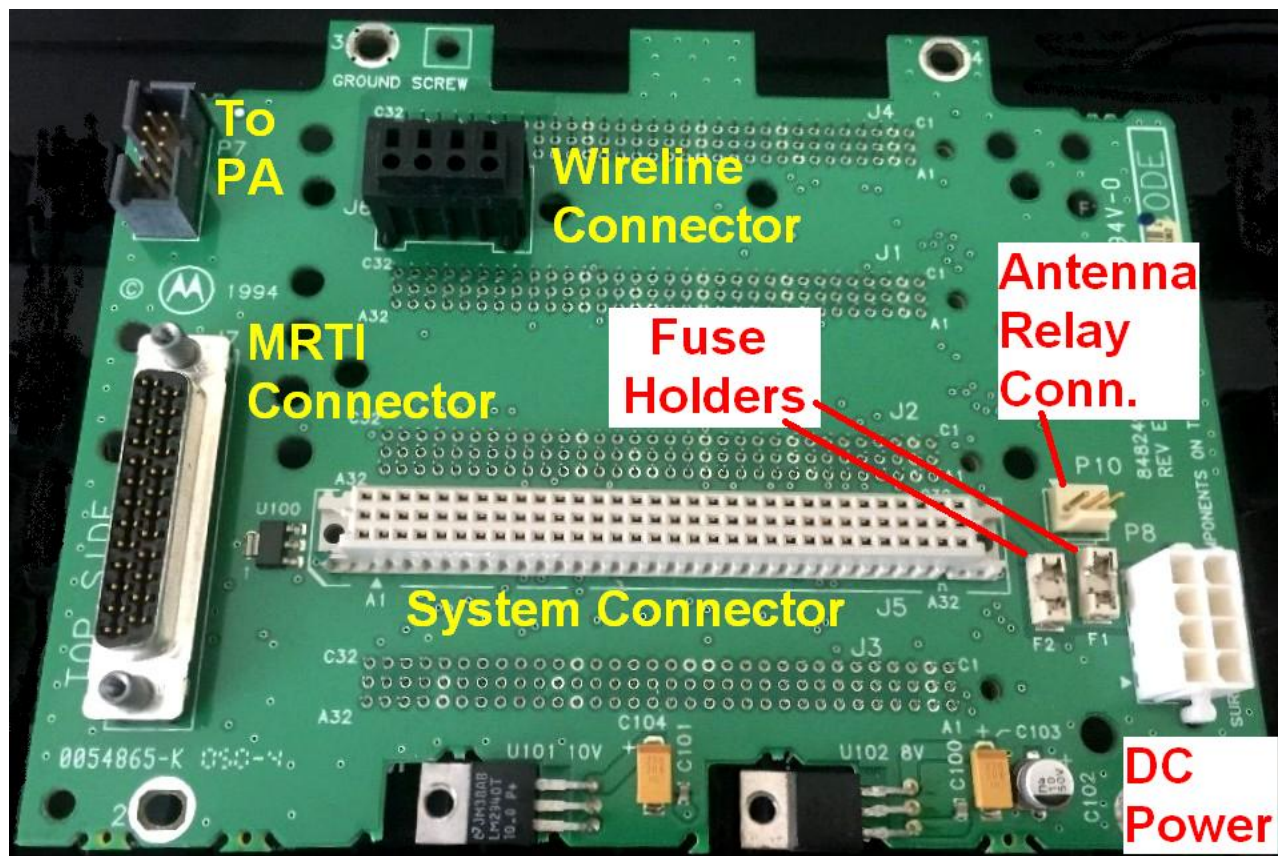
Here's a graphical identification of the various connectors.



Here's an actual photograph with pin numbers added. Click on any photo for a larger view.



Behind the metal plate is the actual backplane. Here's an annotated photo showing the important items.



The following connectors are located on the front (card-cage side) of the backplane and their designation runs from top to bottom. They are referenced by the tables below but are not detailed further.

- J4 Wire line card connector
- J1 Option #1 card connector
- J2 Option #2 card connector
- J3 Station Control Module connector

The following connectors are located on the back of the station. An asterisk (*) at the end of any signal name in these tables denotes active-low. Notes are indicated as a digit within square brackets [n] and appear at the end of these tables.

Motorola sells a generic System Cable Kit, part number TKN9205A for these stations. This cable provides a housing shell that plugs into the 96-pin backplane connector, 30 loose pins, and a quantity of 24 gauge wires with a pin for the header crimped onto one end.

Notice the screw (in the photo above) holding the cable clamp just below the connector? It's centered exactly on J5 between pin columns 16 and 17. This makes a convenient starting point if you're counting pin numbers when testing the station.

J5 System Connector Row A (lower):

Pin #	Pin Assignment	I/O	To / From	Signal Characteristics

A1	GPO_8 (WCO)	O	J1-C32, J2-C32	OCO, 100mA, 40V
A2	PA Fail (Aux I/O)	O	J1-C31, J2-C31	OCO, 100mA, 40V, active low
A3	SCI_CLK1	O	J1-C30, J2-C30, J3-C28	Do not use.
A4	AC Fail	O	P8-5, J1-C29, J2-C29, J3-C24	TTL output, active high
A5	GPI_3 (WCI)	I	J1-C28, J2-C28	Pulled up transistor input, 16V max
A6	GP1_15 (-) (NS)	I	J1-C27, J2-C27	Negative side opto-isolated input, see C7
A7	Ext Failsoft (Aux I/O)	I	J1-C26, J2-C26	Pulled up transistor input, 16V max
A8	GPI_1 (NS)	I	J1-C25, J2-C25	Pulled up transistor input, 16V max
A9	GPI_2 (NS)	I	J1-C24, J2-C24	Pulled up transistor input, 16V max
A10	VSWR_Fail* (Aux I/O)	O	J1-C23, J2-C23	Pulled up transistor output (10kohms to +5Vdc), active low
A11	GPO_2 (WCO)	O	J1-C22, J2-C22	Pulled up transistor output (10kohms to +5Vdc)
A12	GPO_0 (WCO)	O	J1-B25, J2-B25	Pulled up transistor output (10kohms to +5Vdc)
A13	Antenna Relay	O	J10-1, J3-C26	OCO, 200mA, active low
A14	Not Supported	O	J1-C18, J2-C18, J3-C19	
A15	Spare 310	—	—	
A16	Spare 308	—	—	
A17	Aux TX Audio	I	J1-C16, J2-C16, J3-C16	RSS programmable input sensitivity
A18	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc [1]
A19	GND	—	Station ground	
A20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
A21	Not Supported	O	J3-C12	
A22	GP1_7 (WCI)	I	J1-C11, J2-C11	Pulled up transistor input, 16V max.
A23	Spare 323	—	—	
A24	Spare 320	—	—	

A25	Spare 903	–	–	
A26	Ext PTT or GP1_14 (–), [2]	I	J1-C7, J2-C7	Negative side opto-isolated input, see A29
A27	GND	–	Station ground	
A28	GPI_9 (WCI) or GPO_3 (NS)	I/O	J1-C6, J2-C6	Caution: See Auxiliary I/O section for jumpering information
A29	Ext PTT or GPI_14 (+), [2]	I	J1-C5, J2-C5	Positive side opto-isolated input, see A26
A30	AC Fail or GPO_14, [3]	O	J1-C4, J2-C4	One side of normally open relay, see B29
A31	GND	–	Station ground	
A32	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc, [1]

J5 System Connector Row B (middle):

Pin #	Pin Assignment	I/O	To / From	Signal Characteristics
B1	RX Lock (Aux I/O)	O	J1-B32, J2-B32	OCO, 100mA, 40V, active high
B2	GPO_13 (WCO)	O	J1-B31, J2-B31	OCO, 100mA, 40V
B3	RdStat or GPO_15, [4]	O	J1-B30, J2-B30	One side of normally open relay, see C3
B4	Carrier Detect Switch	O	J1-B29, J2-B29, J3-B24	TTL output, active high
B5	GPI_8 (NS)	I	J1-B28, J2-B28	Pulled up transistor input, 16V max
B6	GPI_5 (NS)	I	J1-B27, J2-B27	Pulled up transistor input, 16V max
B7	Ext Repeat* (Aux I/O)	I	J1-B26, J2-B26	Pulled up transistor input, 16V max
B8	Trunk Duplex Enable*	I	J3-B25	TTL input
B9	GPI_13 (WCI) or GPO_7 (NS)	I/O	J1-B24, J2-B24	Caution: See Auxiliary I/O section for jumpering information
B10	Spare 311	–	N/C	
B11	GPI_12 (WCI) or GPO_6 (NS)	I/O	J1-B22, J2-B22	Caution: See Auxiliary I/O section for jumpering information
B12	GPI_11 (WCI) or GPO_5 (NS)	I/O	J1-B23, J2-B23	
B13	Spare 301	–	N/C	

B14	Not Supported	I	J1-B19, J2-B19, J3-B19	TTL input
B15	GND	—	Station ground	
B16	Spare 300	—	—	
B17	Spare 321	—	—	
B18	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc [1]
B19	GND	—	Station ground	
B20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
B21	RdStat or GPO_15, [4]	O	J1-B12	OCO, 100mA, 40V
B22	Spare 322	—	—	
B23	Spare 325	—	—	
B24	Spare 309	—	—	
B25	Spare 902	—	—	
B26	Ext PTT or GPI_14, [2]	I	J1-B7, J2-B7	Pulled up transistor input, 16V max, see A29
B27	GND	—	Station ground	
B28	Line 4+	O	J4-C10	Wire line output balanced, (+)
B29	AC Fail or GPO_14, [3]	O	J1-B4, J2-B4	Other side of normally open relay, see A30
B30	Line 4–	O	J4-A9	Wire line output balanced, (–)
B31	GND	—	Station ground	
B32	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc, [1]

J5 System Connector Row C (upper):

Pin #	Pin Assignment	I/O	To / From	Signal Characteristics
C1	TX Lock (Aux I/O)	O	J1-A32, J2-A32	OCO, 100mA, 40V, active high
C2	Rdstat-R2 Control	O	J1-A31, J2-A31, J3-A26	TTL output, high when unsquelched
C3	RdStat or GPO_15, [4]	O	J1-A30, J2-A30	Other side of normally open relay, see B3

C4	Failsoft Output (Aux I/O)	O	J1-A29, J2-A29	OCO, 100mA, 40V, active low
C5	GPI_4 (WCI)	I	J1-A28, J2-A28	Pulled up transistor input, 16V max
C6	Rx Inhibit	I	J1-A27, J2-A27, J3-B26	TTL input, active low
C7	GPI_15 (+) (NS)	I	J1-A26, J2-A26	Positive side opto-isolated input, see A6
C8	Trunk TX Inhibit*	I	J3-A25	TTL input
C9	RF Relay Ctrl Out (Aux I/O)	O	J1-B5, J2-B5	OCO, 200mA, 40V, active high
C10	Ext PTT* Out (Aux I/O), [5]	I	J1-A23, J2-A23, J3-A23	TTL input
C11	RSSI	O	J1-A22, J2-A22, J3-A22	Typically 0.5Vdc for -120dBm to 3.5 Vdc for -40 dBm carrier. [6]
C12	GPI_10 (WCI) or GPO_4 (NS)	I/O	J1-A24, J2-A24	Caution: See Auxiliary I/O section for jumpering information
C13	Spare 304	–	–	
C14	Not Supported	O	J1-A19, J2-A19, J3-A19	
C15	GND	–	Station ground	
C16	GND	–	Station ground	
C17	Disc RX Audio	O	J1-A16, J2-A16, J3-A16	Discriminator audio, flat response. 80mV to 400mV for 60% deviation
C18	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc [1]
C19	GND	–	Station ground	
C20	5 VDC	O	P8 pins 7, 8	+5.1 ± 0.25 Vdc
C21	Not Supported	O	J3-A12	
C22	Spare 302	–	–	
C23	Spare 324	–	–	
C24	GPIO_0 (CNTR I/O)	I/O	J1-A9, J2-A9, J3-A17	TTL input/output
C25	Spare 317	–	–	

C26	Spare 901	–	–	
C27	GND	–	Station ground	
C28	Line 3+	I	J4-C12	Wire line input balanced, (+)
C29	GPIO_1 (CNTR I/O)	I/O	J1-A4, J2-A4, J3-A13	TTL input/output
C30	Line 3–	I	J4-A11	Wire line input balanced, (–)
C31	GND	–	Station ground	
C32	Control 14.2 VDC	O	P8 pins 3, 4 (via F2)	+14.2Vdc, [1]

NOTES for the above tables:

1. For dc-only 250W power supplies, this voltage is equal to the input supply voltage.
2. This pin can be jumpered for Ext PTT (supported) or GPI_14 (not supported). See Aux I/O jumpers P2 and P9.
3. This pin can be jumpered for AC Fail (supported) or GPO_14 (not supported). See Aux I/O jumper P5.
4. This pin can be jumpered for RdStat (supported) or GPO_15 (supported). See Aux I/O jumpers P3 and P4.
5. Ext PTT signal output, taken from Ext PTT input. The output signal can be inverted, depending on jumper settings. See jumpers P2, P6, P9.
6. RSSI variation with carrier level is approximately 40mV/dBm.
7. Fuses F1 and F2 (both 5A) are located behind the plate that latches the connector into J5, just below J10.
8. In the Signal Characteristics column, "OCO" stands for Open Collector Output, "WCI" stands for Wild Card Input, and "WCO" stands for Wild Card Output.

Commonly Used Signals on J5:

The Ext. PTT Input inhibits the internal Tx PL/DPL signal. All audio, including PL/DPL, must come from another (external) source.

Name	Description	Pin #	Signal Characteristics
RdStat	TTL compatible logic output indicating Rx. Activation status.	B3, B21, C2, C3	0.0 to 0.2Vdc with squelched receiver, 4.8 to 5.2Vdc with un-squelched receiver.
Disc. Rx. Audio	Unfiltered and un-squelched discriminator audio without de-emphasis.	C17	80mV minimum to 400mV maximum for 60% system deviation. Output level is RSS programmable.
RSSI	DC output volts related to received carrier	C11	Typically 0.5Vdc for -120dBm to 3.5 Vdc for -40 dBm carrier. Variation with carrier level @ approximately

	level.		40mV/dBm.
Cntrl 14.2V	14.2 volts dc output. For dc-only 250W power supplies, this voltage is equal to the input supply voltage.	A18, B18, C18, A32, B32, C32	Total current through all of these pins should not exceed 1 amp.
5 V	5.1 \pm 0.25 volts dc output.	A20, B20, C20	Total current through all of these pins should not exceed 500 mA.
GND	Ground.	A19, B19, C19, A27, B27, C27, A31, B31, C31	Total current through all of these pins should not exceed 1.5 amp.
Aux.Tx Audio	Tx. modulation input from external source.	A17	RSS programmable sensitivity. For R03.01 (host software) and earlier, the fixed sensitivity is @ 172 mVrms for 60% system deviation. RSS programmable for pre-emphasized or flat response. DC offset +2.4V. High impedance input.
Ext. PTT	External Tx. keying signal.	C10	Grounding Ext. PTT pin causes Tx to key. 5.0Vdc on pin when Tx is not keyed. Note: To transmit signaling code (PL / DPL) by external PTT, it should be mapped (via RSS) to Wire line, and external modulation input should be routed to wire line.
AC_Fail	Logic output to indicate failure of AC line input.	A4	Requires a Battery Revert dc supply. Line goes high (5.0Vdc) if AC fails.
Wire line Pair 3+/-	Additional wire line for other functions.	C28, C30	Line sensitivity and operation identical to line pairs 1 and 2.
Wire line Pair 4+/-	Additional wire line for other functions.	B28, B30	Line sensitivity and operation identical to line pairs 1 and 2

J6 Wire Line Terminals 1-4:

In the photo of the backplane, the wire line connector on my station is shown pushed up at an angle. It shouldn't be that way; it should come straight out at right angles to the backplane. I have fixed this.

The connector is meant to accept solid wire or stranded wire that's been twisted and tinned. The wires get inserted into the round holes. To release the wires, insert a round tool, a small nail, or another wire into the rectangular hole above the wire. Motorola also sells a Wireline Connector Tool just for this purpose: p/n 6600809D00.

Pin #	Signal	Usage and Other Notes
1	Line 1-	Tx wire line input for 4-wire configuration. Input level is programmable by RSS between 0 dBm and -50 dBm. Do NOT use this line pair for 2-wire wire line configuration.
2	Line 1+	
3	Line 2-	Rx wire line output for 4-wire configuration. Output level is programmable between +7 dBm and -20 dBm for 100% deviation. Use this line pair for 2-wire wire line configuration.
4	Line 2+	

J7 6809/MRTI Connector Pins 1-25:

More information is needed on the MRTI connector signals. The DCV and Notes were obtained by experimenting with a 100w UHF station configured as a repeater with MRTI Enabled.

The various audio signals have a frequency response of about 300 to 3000 Hz, i.e. they won't pass PL/DPL. If specified in the radio's personality, PL/DPL **is** transmitted along with MRTI Tx Audio when MRTI PTT is grounded.

Remember to use a DC blocking capacitor (10-100uF, 16V) on any audio signal that has DC voltage on it.

If anyone has additional information regarding the signals on the MRTI connector, please pass it on to the author.

Pin #	Signal Name	DCV	Notes
1	MRTI Tx Audio	2.4	Pre-emphasized, 0.4V/kHz at 1 kHz
2	Trunk MRTI PTT*	5.1	Ground for Tx (same as pin 11)
3	Spare		
4	MRTI Monitor*	5.1	Ground probably disables Rx coded squelch
5	Spare		
6	Spare		
7	MRTI Rx Audio	2.4	De-emphasized and limited to 3 kHz
8	Patch Inhibit* or RSTAT	5.1	(same as pin 25)
9	GND	0.0	
10	Aux Carrier* or TSTAT	5.1	Low when Tx is on (same as pin 12)
11	Trunk MRTI PTT*	5.1	Ground for Tx (same as pin 2)
12	Aux Carrier* or TSTAT	5.1	Low when Tx is on (same as pin 10)

13	Trunk Tx Data+	3.9	
14	Spare		
15	MRTI Rx Carrier*	O.C.	Goes to ground with properly coded carrier
16	GND	0.0	
17	GND	0.0	
18	GND	0.0	
19	GND	0.0	
20	Spare		
21	Trunk Tx Data-	0.0	
22	Trunk Rx Audio	4.8	De-emphasized and limited to 1 kHz
23	Trunk Mute*	5.1	
24	PL Strip* or CCI*	5.1	Ground disables coded Tx
25	Patch Inhibit* or RSTAT	5.1	(same as pin 8)

NOTE: O.C. = Open Collector, active-low.

P7 Power Amplifier Interface Pins 1-10:

Orientation looking into the rear of the station:

1 2
3 4
5 6
7 8
9 10

Pin #	Pin Assignment
1	Voltage Forward
2	PA Enable*
3	PA Reset
4	V Control
5	GND
6	PA D/A CS*
7	SPI CLK
8	MOSI

9	MISO
10	PA A/D CS*

J8 Backplane Power Pins 1-8:

This goes directly to the 8-pin connector on the power supply. Orientation looking into the rear of the station:

4 8
3 7
2 6
1 5

Pin #	Pin Assignment	Color
1	GND	BLACK
2	GND	BLACK
3	+14.2 VDC	GRAY
4	+14.2 VDC	GRAY
5	+5 VDC	OR/WH
6	+5 VDC	OR/WH
7	GND	BLACK
8	AC Fail	BROWN

J10 Antenna Relay Pins 1-3:

Orientation looking into the rear of the station:

1 2 3

The external antenna relay connects to pins 1(-) and 3(+).
PTemp+ rests at +4.95 VDC.

Pin #	Pin Assignment
1	Antenna Relay*
2	PTemp+
3	+14.2 VDC

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While not part of the backplane, this connector feeds DC power to the RF power amplifier and is visible

from the back of the station. It is documented here for completeness.

UHF 100 Watt PA Power Connector Pins 1-6:

This goes directly to the 6-pin connector on the power supply. The 40w PAs operate from 14.2 VDC only. Orientation looking from the rear of the station:

3 6
2 5
1 4

Pin #	Pin Assignment	Color
1	+14.2 VDC	BLUE
2	Ground	BLACK
3	+28.6 VDC	RED
4	+14.2 VDC	BLUE
5	Ground	BLACK
6	+28.6 VDC	RED

Credits and Acknowledgements:

This information came from the Motorola MTR2000 Basic Service Manual, the MTR2000 Installation and Operation manual, the MTR2000 RSS Help screens and files, and the MTR3000 Basic Service Manual. Additional information, such as wire colors, came from direct examination of a 100w UHF MTR2000 station.

Contact Information:

The author can be contacted at: his-callsign [at] comcast [dot] net.

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